IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF PENNSYLVANIA

CARNEGIE MELLON UNIVERSITY, Plaintiff, v. MARVELL TECHNOLOGY GROUP, LTD., and MARVELL SEMICONDUCTOR, INC., Defendants.	)	Civil Action No. 2:09-cv-00290-NBF

STATEMENT OF UNDISPUTED MATERIAL FACTS IN SUPPORT OF MARVELL'S MOTION FOR PARTIAL SUMMARY JUDGMENT OF PATENT INVALIDITY UNDER 35 U.S.C. § 112

Introduction

The following definitions are applicable to terms employed in this Statement of Undisputed Material Facts in Support of Marvell's Motion for Partial Summary Judgment of Patent Invalidity Under 35 U.S.C. § 112:

A. The " '839 patent" means United States Patent Number 6,201,839.

B. The " '180 patent" means United States Patent Number 6,438,180.

C. The "CMU patents" mean the '180 patent and the '839 patent.

D. The "Group I Claims" means the claims 1-5 of the ’839 patent, and claims 1 and 2 of the ’180 patent.

E. The "Worstell patent" means United States Patent Number 6,282,251.

F. "Marvell’s MSJ" means the motion for partial summary judgment filed by Marvell on December 22, 2010, all related briefing and oral argument by the parties, and the Court's opinion on September 28, 2011.

G. References to "Ex. __" refers to exhibits attached to the declaration of David C. Radulescu filed herewith.

H. Any references to the word "function" are to be interpreted as the Court has construed that term in connection with Marvell's MSJ as set forth in the Court's Memorandum Order dated September 28, 2011.

Material Claims of the CMU Patents

1. Claim 1 of the ’839 patent claims:

> A method of determining branch metric values for branches of a trellis for a Viterbi-like detector, comprising:
>
> selecting a branch metric function for each of the branches at a certain time index; and
>
> applying each of said selected functions to a plurality of signal samples to determine the metric value corresponding to the branch for which the applied branch metric function was selected, wherein each sample corresponds to a different sampling time instant.

(Ex. 1 (’839 patent) at 13:61-14:2.)

2. Claim 2 of the ’839 patent claims:

> The method of claim 1 further comprising the step of receiving said signal samples, said signal samples having signal-dependent noise, correlated noise, or both signal-dependent and correlated noise associated therewith.

(*Id.* at 14:3-6.)

3. Claim 3 of the ’839 patent claims:

> The method of claim 1 wherein said branch metric functions for each of the branches are selected from a set of signal-dependent branch metric functions.

(*Id.* at 14:7-9.)

4. Claim 4 of the ’839 patent claims:

> A method of determining branch metric values for branches of a trellis for a Viterbi-like detector, comprising:
>
> selecting a branch metric function for each of the branches at a certain time index from a set of signal-dependent branch metric functions;

and

applying each of said selected functions to a plurality of signal samples to determine the metric value corresponding to the branch for which the applied branch metric function was selected, wherein each sample corresponds to a different sampling time instant.

(*Id.* at 14:10-19.)

5. Claim 5 of the ’839 patent claims:

The method of claim 4 further comprising the step of receiving said signal samples, said signal samples having signal-dependent noise, correlated noise, or both signal-dependent and correlated noise associated therewith.

(*Id.* at 14:20-23.)

6. Claim 1 of the ’180 patent” claims:

A method of determining branch metric values in a detector, comprising:

receiving a plurality of time variant signal samples, the signal samples having one of signal-dependent noise, correlated noise, and both signal dependent and correlated noise associated therewith;

selecting a branch metric function at a certain time index; and

applying the selected function to the signal samples to determine the metric values.

(Ex. 2 (’180 patent) at 15:39-48.)

7. Claim 2 of the ’180 patent claims:

The method of claim 1 wherein the branch metric function is selected from a set of signal-dependent branch metric functions.

(*Id.* at 15:49-51.)

Conception and Prosecution of the CMU Patents

8. The CMU patents both claim priority to provisional patent application no. 60/046,006. (Ex. 1; Ex. 2.)

9. Provisional patent application no. 60/046,006 was filed with the Patent Office on May 9, 1997. (Ex. 1 at 1:7-9 (“This application claims priority to Provisional Serial No. 60/046,006, filed May 9, 1997, under 35 U.S.C. Section 119(c).”).)

10. (a) Utility patent application number 09/055,003 was filed with the Patent Office on April 3, 1998, claiming **priority to provisional patent** application number 60/046,006. (Ex. 1 at 1:7-9 ("This application claims priority to Provisional Serial No. 60/046,006, filed May 9, 1997, under 35 U.S.C. Section 119(c).").)

(b) Utility patent application number 09/259,195 was filed with the Patent Office on March 1, 1999, also claiming **priority to provisional patent** application number 60/046,006. (Ex. 2 at 1:6-9 ("This application is a continuation-in-part of U.S. patent application Ser. No. 09/055,003, filed Apr. 3, 1998, which claims priority to Provisional Ser. No. 60/046,006, filed May 9, 1997, under 35 U.S.C. Section 119(c).").)

11. The Group I Claims issued as part of the CMU patents. Exs. 1 and 2.

The Worstell Patent Background

12. The Worstell patent describes a "Modified Viterbi Detector Which Accounts for Correlated Noise," naming inventor Glen Douglas Worstell and assignee Seagate Technology LLC. The application for the Worstell patent was filed on March 21, 1995, and the patent issued on August 28, 2001. (Ex. 3 (Worstell patent).)

Construction of Branch Metric "Function"

13. In the Court's Memorandum Opinion ruling on Marvell's MSJ, the Court construed "function" in connection with its ruling that the Worstell patent does not disclose a "set of branch metric functions" as required by the "selecting" step of the Group I Claims. Dkt. No. 306 at 16-17.

14. Under the ordinary meaning of branch metric function, simply adding another variable into a branch metric function – here the target value – does not operate to convert that single function into multiple functions. Dkt. No. 306 at 16.

15. Under the ordinary meaning of "function," simply adding another variable into a branch metric function does not operate to convert that single function into multiple functions. Dkt. No. 306 at 16.

16. Variation of the target value in Equation 20 of the Worstell Patent does not render Equation 20 of the Worstell Patent a set of functions. Dkt. No. 306 at 16

17. Variation of the noise statistics reflected in the tap weights W_i in Equation 20 of the Worstell Patent does not render Equation 20 of the Worstell Patent a set of functions.

18. Variation of the noise terms ($X_{b,(n-i)t}$) in Equation 20 of the Worstell Patent does not render Equation 20 of the Worstell Patent a set of functions. Dkt. No. 16

Level of Ordinary Skill in the Art

19. A person of ordinary skill in the art for the CMU patents would have at least a Master's degree in electrical engineering specializing in signal processing and digital communications with at least two years of experience in that field or a related industry. Dkt. No. 84 (Proakis Markman Decl.) at 9.

The CMU and Worstell Patents

20. The specifications of the CMU patents (excluding any claims) do not convey with reasonable clarity to those skilled in the art that the named inventors were in possession of the alleged invention associated with the Group I Claims. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

21. The specifications of the CMU patents (excluding any claims) only describe the use of a single branch metric function in a Viterbi detector to determine branch metric values across different branches at a given time index. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

22. There is no reasonably clear disclosure in the specifications of the CMU patents (excluding any claims) of an embodiment of a detector where a set of branch metric functions are used as required by the Group I Claims. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

23. The scope of the Group I Claims exceeds the scope of what the named inventors disclosed in the specifications of the CMU patents (excluding any claims). Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

24. The Worstell patent's branch metric Equation 20, as "further modified" by the multiplier described in the Worstell patent at column 10:48-56, is a single branch metric function. Ex. 3 at col. 10, ln. 48-56.

25. The Worstell patent's branch metric Equation 20, as "further modified" by the multiplier described in the Worstell patent at column 10:48-56, is not a "set" of branch metric functions. Ex. 3 at col. 10, ln. 48-56.

26. The "variance dependent" branch metric (Equation 10) in the CMU patents is a single branch metric function. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

27. The "variance dependent" branch metric (Equation 10) in the CMU patents is a single branch metric. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

28. The "variance dependent" branch metric (Equation 10) in the CMU patents is not a set of branch metric functions. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

29. The "variance dependent" branch metric (Equation 10) in the CMU patents is not a set of branch metrics. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

30. The "correlation-sensitive" branch metric (Equation 13) in the CMU patents is a single branch metric function. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

31. The "correlation-sensitive" branch metric (Equation 13) in the CMU patents is a single branch metric. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

32. The "correlation-sensitive" branch metric (Equation 13) in the CMU patents is not a set of branch metric functions. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

33. The "correlation-sensitive" branch metric (Equation 13) in the CMU patents is not a set of branch metrics. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

34. The "variance dependent" branch metric (Equation 10) in the CMU patents includes target values. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

35. The "variance dependent" branch metric (Equation 10) in the CMU patents includes noise statistics that vary from branch to branch of a trellis. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

36. The "variance dependent" branch metric (Equation 10) in the CMU patents includes variables for this function. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

37. The "correlation-sensitive" branch metric (Equation 13) in the CMU patents includes target values. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

38. The "correlation-sensitive" branch metric (Equation 13) in the CMU patents includes noise statistics that vary from branch to branch of a trellis. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

39. The "correlation-sensitive" branch metric (Equation 13) in the CMU patents includes variables for this metric. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

40. Based on the Court's construction of "function," there is no disclosure in the CMU patents that supports or describes the "selecting" steps of the Group I Claims. Dkt. 306 at 16-17; Ex. 1, Ex. 2.

41. The disclosed "correlation-sensitive" branch metric function (Eqn. 13) of the CMU patents is only a single function and not a set of functions. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

42. The CMU patents (excluding any claims) do not disclose any Viterbi detector where more than one branch metric function is used during operation in a single detector. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

43. The CMU patents (excluding any claims) do not disclose any Viterbi detector where more than one branch metric is used during operation in a single detector. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

44. The CMU patents (excluding any claims) do not disclose a detector that selects a branch metric function from a set of different branch metric functions. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

45. The CMU patents (excluding any claims) do not disclose a detector that selects a branch metric from a set of different branch metrics. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

46. The CMU patents (excluding any claims) do not disclose any criteria for making a selection of a branch metric function from a set of different branch metric functions. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

47. The CMU patents (excluding any claims) do not disclose any criteria for making a selection of a branch metric from a set of different branch metrics. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

48. The only Viterbi detectors disclosed in the CMU patents (excluding any claims) are based on a design that uses a single branch metric function across different branches of a trellis. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

49. There is no disclosure in the CMU patents (excluding any claims) of using different branch metric functions in a single detector. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

50. There is no disclosure of how a person of ordinary skill in the art would select in the CMU patents which function to use for which branch of a trellis if different functions were used. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

51. The prosecution history of the '839 patent shows that the claims were broadened to cover the use of more than one branch metric function in the detector. Ex. 7.

52. The amendment of the '839 patent to cover the use of more than one branch metric function in the detector was not supported by the disclosure in the specification. Ex. 7, Ex. 5.

53. Based on the Court's interpretation of the "selecting" step, including the word "function," a person of skill in the art would not be able to clearly distinguish what material is claimed from what material is not claimed. Dkt. 306; Ex. 1, Ex. 2.

The Worstell Patent

54. The Worstell patent is entitled "Modified Viterbi detector which accounts for Correlated Noise" and is generally directed towards a Viterbi detector which uses branch metrics that are "based on a current signal sample, as well as one or more previous signal samples," (Worstell patent at 2:4-5) and therefore can "account[] for correlated noise in the system." Ex. 3, Worstell patent at 2:6-7.

55. The Worstell patent discloses "further modifying" the branch metrics to take so-called "transition noise" into account. Ex. 3, Worstell patent at 10:48-56.

56. The Viterbi detector disclosed in the Worstell patent takes both correlated and signal-dependent noise into account through a "further modified" branch metric. Ex. 3.

57. The Worstell patent discloses a branch metric equation (Equation 20):

$$B_{b,nt} = X^{2}_{b,nt} - 2X_{b,nt}\sum_{i=1}^{L} X_{b,(n-i)t}W_i$$

where $B_{b,nt}$ is the branch metric for branch b at time nt;
$X_{b,nt}$ is the noise and equalization error at time nt for branch b;

W_i is the i^{th} tap weight of FIR filter **22**;
L is the number of tap weights beyond the center weight.

Ex. 3, Worstell patent at 9:50-58.

58. The Worstell patent describes how to further modify the branch metric in Equation 20 to take into account "transition noise." Ex. 3.

59. The Worstell patent refers to multiplying the metric in Equation 20 by a "fraction that depends on the transition noise standard deviation." Ex. 3, Worstell patent at 10:48-56.

60. The standard deviation of the transition noise ($\sigma_{b,nt}$) in the Worstell patent is the square root of the variance ($\sigma_{b,nt}^2$). Ex. 3, at col. 10, ln. 48-56.

61. The fraction referred to in the Worstell patent at col 10, ln. 48-56 can be expressed as "[$1/\sigma_{b,nt}^2$]". Ex. 3, at col. 10, ln. 48-56.

62. The fraction referred to in the Worstell patent at col 10, ln. 48-56 can be expressed as "[$1/\sigma_{b,nt}$]". Ex. 3, at col. 10, ln. 48-56.

63. The Worstell patent discloses a "further modified" metric that can be expressed as follows:

$$B_{b,nt} = [X^2_{b,nt} - 2X_{b,nt} \sum X_{b,(n-i)t} W_i] \times [1/\sigma_{b,nt}^2]$$

where $B_{b,nt}$ is the branch metric for branch b at time nt;
$X_{b,nt}$ is the noise and equalization error at time nt for branch b;
W_i is the i^{th} tap weight of FIR filter **22**;
L is the number of tap weights beyond the center weight;
the sum $\sum$ is taken from i = 1 to i = L; and
$[1/\sigma_{b,nt}^2]$ is the referenced "fraction that depends on the transition noise standard deviation."

Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

64. One of the components of Worstell's "further modified" metric is $X_{b,nt}$, which is defined as the "noise and equalization error" at time *nt* for branch *b*. Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

65. Equation 2 of the Worstell patent defines $X_{b,nt}$ as the difference between the correct (target) sample value and the actual received (expected) value:

$$X^2_{b,nt} = (y_{b,nt} - y_{nt})^2$$

where $y_{b,nt}$ is the correct (target) sample value for branch b; and
y_{nt} is the actual received (expected) value.

Ex. 3, Worstell patent at 4:42-44.

66. The variable $X^2_{b,nt} = (y_{b,nt} - y_{nt})^2$ in the Worstell patent corresponds to the variable $(r_i - m_i)^2$ in the CMU patents. Ex. 3, Worstell patent at 4:42-44; Ex. 1, Ex. 2.

67. Both $X^2_{b,nt}$ in the Worstell patent and $(r_i - m_i)^2$ in the CMU patents are simply the square of the difference between the actual received samples and their correct (target) values. Ex. 3, Worstell patent at 4:42-44; Ex. 1, Ex. 2.

68. The Worstell patent refers to $X^2_{b,nt}$ as the "noise and equalization error." Ex. 3 at col. 9, ln. 45-58.

69. The "further modified" branch metric described in Worstell depends upon a number of variables. Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

70. The "further modified" branch metric described in Worstell depends upon a variable referred to as the "actual received value." Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

71. The "further modified" branch metric described in Worstell depends upon a variable referred to as the "correct sample values." Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

72. The "further modified" branch metric described in Worstell depends upon a variable referred to as the "noise and equalization error." Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

73. The "further modified" branch metric described in Worstell depends upon a variable referred to as the "transition noise standard deviation." Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

74. The "further modified" branch metric described in Worstell depends upon signal samples. Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

75. The "further modified" branch metric described in Worstell depends upon target values. Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

76. The "further modified" branch metric described in Worstell depends upon noise terms. Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

77. The "further modified" branch metric described in Worstell depends upon noise statistics. Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

78. Based on the Court's construction of "function," Worstell's "further modified" branch metric function includes variables that vary from branch to branch at a given time index. Dkt. No. 306 at 16; Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

79. Based on the Court's construction of "function," Worstell's "further modified" branch metric includes variables that vary from branch to branch at a given time index. Dkt. No. 306 at 16; Ex. 3 at col. 9, ln. 45 to col. 10, ln. 7.

80. "Correlation" is taken into account in the Worstell branch metric function by making it depend upon the prior (historical) noise terms, namely, the terms $X_{b,(n-i)t}$. Ex. 3, at col. 9, ln. 45 to col. 10, ln. 7.

81. Correlation" is taken into account in the Worstell branch metric by making it depend upon the prior (historical) noise terms, namely, the terms $X_{b,(n-i)t}$. Ex. 3, at col. 9, ln. 45 to col. 10, ln. 7.

82. Worstell's "further modified" branch metric function depends on prior (historical) noise terms. Ex. 3, at col. 9, ln. 45 to col. 10, ln. 7.

83. Worstell's "further modified" branch metric depends on prior (historical) noise terms. Ex. 3, at col. 9, ln. 45 to col. 10, ln. 7.

84. "Signal-dependent" noise is taken into account in Worstell's branch metric function by making it depend upon the transition noise standard deviation (σb,nt). Ex. 3, at col. 9, ln. 45 to col. 10, ln. 7.

85. "Signal-dependent" noise is taken into account in Worstell's branch metric by making it depend upon the transition noise standard deviation (σb,nt). Ex. 3, at col. 9, ln. 45 to col. 10, ln. 7.

86. "Signal-dependent" noise is taken into account in Worstell's branch metric function by making it depend upon the variance σb,nt2. Ex. 3, at col. 9, ln. 45 to col. 10, ln. 7.

87. "Signal-dependent" noise is taken into account in Worstell's branch metric by making it depend upon the variance σb,nt2. Ex. 3, at col. 9, ln. 45 to col. 10, ln. 7.

88. Worstell's "further modified" branch metric function is a signal-dependent branch metric function that depends on the noise statistics that vary from branch to branch of the trellis. Ex. 3, at col. 9, ln. 45 to col. 10, ln. 7.

89. Worstell's branch metric is a signal-dependent branch metric function that depends on the noise statistics that vary from branch to branch of the trellis. Ex. 3, at col. 9, ln. 45 to col. 10, ln. 7.

The CMU Patents

90. The CMU patents are "directed generally to high density magnetic recording [data] detectors." Ex. 1, '839 patent at 1:21-22; Ex. 2.

91. The CMU patents describe methods to account for noise in the readback signal with the objective of improving the detection of the desired signal. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

92. The specifications of the CMU patents describe a magnetic recording system (FIG. 1) that employs a "CS-MLSD detector circuit 28," which refers to a "correlation sensitive-maximum likelihood sequence detector" and is illustrated in FIG. 2. Ex. 1, '839 patent at col. 3:1-52.

93. The specifications of the CMU patents describe a detector circuit as, "The CS-MLSD detector circuit 28 is a part of the detector circuit 26 of FIG. 1. The detector circuit 28 has a feedback circuit 32 which feeds back into a Viterbi-like detector 30." Ex. 1, '839 patent, col. 3:30-33.

94. The detection method described in the CMU patents did not require modifying the Viterbi-like detector 30 over detectors used in the prior art:

> "The algorithm does not require replacing current detectors. It simply adds two new blocks in the feedback loop to adaptively estimate the branch metrics used in the Viterbi-like circuit 30."
>
> Ex. 1, '839 patent at col. 3:40-44.

95. The CMU patents describe the use of a "conventional" Viterbi detector with an additional feedback circuit 32. *Id.*

96. The feedback circuit 32 described in the CMU patents includes a "noise statistics tracker circuit 34 . . . . to update the noise statistics, i.e., to update the noise covariance matrices"

as well as a "metric computation update circuit 36 . . . . to calculate the branch metrics needed in the Viterbi-like algorithm." Ex. 1, '839 patent, col. 3:36-40.

97. There is no disclosure in the Detailed Description of the Invention portions of the CMU patents of adding a branch metric "selecting" circuit to the detector. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

98. There is no disclosure in the Detailed Description of the Invention portions of the CMU patents of modifying the Viterbi detector to allow it to apply different branch metric functions across different branches of a trellis at a given time index. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

99. There is no disclosure in the Detailed Description of the Invention portions of the CMU patents of modifying the Viterbi detector to allow it to apply different branch metrics across different branches of a trellis at a given time index. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

100. The CMU patents disclose the derivation of a particular branch metric function (Eqn. 13) to be used in the metric computation update circuit 36 that takes both correlated noise and signal dependent noise into account. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

101. The CMU patents teach using the branch metric function (Eqn. 13) in an otherwise “conventional” Viterbi-like detector that selects the most likely path through a trellis diagram representing a signal. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

102. There is no disclosure in the CMU patents of modifying the Viterbi detector design to use multiple branch metric functions during operation to determine branch metric

values in the trellis at a given time index. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

103. There is no disclosure in the Detailed Description of the Invention of the CMU patents of modifying a Viterbi detector design to use a set of branch metric functions during operation to determine branch metric values in the trellis at a given time index. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

104. There is no disclosure in the Detailed Description of the Invention of the CMU patents of modifying a Viterbi detector design to use a set of branch metrics during operation to determine branch metric values in the trellis at a given time index. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

105. The CMU patents describe a "variance dependent" branch metric (Eqn. 10), expressed mathematically as follows:

$$M_i = log\ \sigma_i^2 + N_i^2 / \sigma_i^2 = log\ \sigma_i^2 + (r_i - m_i)^2 / \sigma_i^2$$

where σ_i^2 is the variance of the noise sample that depends on the written symbol sequence; and
N_i is the difference between the observed samples and their expected (target) values, namely, $(r_i - m_i)$.

Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

106. The "variance dependent" branch metric (Eqn. 10) of the CMU patents depends upon a number of variables. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

107. The "variance dependent" branch metric (Eqn. 10) of the CMU patents depends upon observed signal sample. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

108. The "variance dependent" branch metric (Eqn. 10) of the CMU patents depends upon expected (target) values. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

109. The "variance dependent" branch metric (Eqn. 10) of the CMU patents depends upon noise samples. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

110. The "variance dependent" branch metric (Eqn. 10) of the CMU patents depends upon the standard deviation of noise samples. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

111. Based on the Court's construction of "function," the "variance dependent" branch metric equation (equation 10) is a single branch metric function and not a set of branch metric functions. Dkt. 306 at 16-17; Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

112. The "variance dependent" branch metric (Eqn. 10) is not correlation sensitive. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

113. The "variance dependent" branch metric (Eqn. 10) is incapable of taking "correlation" into account. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

114. The "variance dependent" branch metric (Eqn. 10) does not depend upon any prior observed signal samples. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

115. The "variance dependent" branch metric (Eqn. 10) is not dependent upon a "plurality" of signal samples as recited in the Group I Claims. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

116. The "variance dependent" branch metric (Eqn. 10) is dependent upon a single signal sample. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

117. The "variance dependent" branch metric (Equation 10) disclosed in the CMU patents is not dependent upon a plurality of signal samples. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

118. The Group I Claims are not directed to a detector employing the "variance dependent" branch metric (Equation 10) disclosed and described in the CMU patents. Ex. 1, Ex. 2.

119. The CMU patents describe a "correlation-sensitive" branch metric equation (Eqn. 13), expressed mathematically as follows:

$$M_i = \log \det C_i / \det c_i + \underline{N}_i^T C_i^{-1} \underline{N}_i - \underline{n}_i^T c_i^{-1} \underline{n}_i$$

where C_i is the covariance matrix;
c_i is the LxL lower principal submatrix of C_i;
N_i is the vector of differences between the observed sample values and their expected values $[(r_i - m_i)(r_{i+1} - m_{i+1})(r_{i+2} - m_{i+2}) \ldots (r_{i+L} - m_{i+L})]^T$; and
n_i collects the last L elements of N_i (in other words, the prior [historical] noise terms, *e.g.*, $[(r_{i+1} - m_{i+1})(r_{i+2} - m_{i+2}) \ldots (r_{i+L} - m_{i+L})]^T$).

Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

120. The "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents depends upon a number of variables. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

121. The "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents depends upon the observed signal sampleS. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

122. The "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents depends upon the expected (target) values. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

123. The "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents depends upon the (historical) noise terms. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

124. The "correlation-sensitive" branch metric equation (Eqn. 13) of the CMU patents depends upon noise statistics. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

125. The "correlation-sensitive" branch metric equation (Eqn. 13) of the CMU patents depends upon the covariance matrix C_i . Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

126. The "correlation-sensitive" branch metric equation (Eqn. 13) of the CMU patents depends upon c_i, a lower principal submatrix of C_i. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

127. Based on the Court's construction of "function," the "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents is a single branch metric function. Dkt. No. 306 at 16-17; Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

128. Based on the Court's construction of "function," the "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents is not a set of branch metric functions. Dkt. No. 306 at 16-17; Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

129. Eqn. 13 of the CMU patents depends on the same four types of variables as in Worstell's metric (Equation 20): (1) the signal sample; (2) the target values; (3) the prior (historical) noise terms; and (4) noise statistics (including the covariance matrix C_i , which depends upon the transition noise standard deviation). Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8; Ex. 3 at col. 10, ln. 48-56.

130. Eqn. 13 of the CMU patents and Worstell's "further modified" both depend on the signal sample. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8; Ex. 3 at col. 10, ln. 48-56.

131. Eqn. 13 of the CMU patents and Worstell's "further modified" metric both depend on the target values. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8; Ex. 3 at col. 10, ln. 48-56.

132. Eqn. 13 of the CMU patents and Worstell's "further modified" metric both depend on noise terms (defined as the difference between signal sample values and target values). Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8; Ex. 3 at col. 10, ln. 48-56.

133. Eqn. 13 of the CMU patents and Worstell's "further modified" metric both depend on noise statistics. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8; Ex. 3 at col. 10, ln. 48-56.

134. Eqn. 13 of the CMU patents and Worstell's "further modified" metric both depend on the transition noise standard deviation. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8; Ex. 3 at col. 10, ln. 48-56.

135. The covariance matrix C_i in Eqn. 13 of the CMU patents includes a component that depends upon the "transition noise standard deviation" variable used in Worstell's metric (Equation 20). Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8; Ex. 3 at col. 10, ln. 48-56.

136. The "selecting" step of the Group I Claims require a set of branch metric functions to chose from. Ex. 1, Ex. 2.

137. The "selecting" step of the Group I Claims require a set of branch metrics to chose from. Ex. 1, Ex. 2.

138. The "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents is only a single function under the Court's construction of "function." Dkt. No. 306 at 16-17; Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

139. The "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents is not a plurality of functions. Dkt. No. 306 at 16-17; Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

140. A detector that employs the "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents would not be covered by the Group I Claims. Ex. 1, Ex. 2.

141. The specifications of the CMU patents (excluding any claims) do not provide any disclosure or discussion of a "set of branch metric functions" that can be employed in a detector covered by the Group I Claims. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

142. The specifications of the CMU patents (excluding any claims) do not provide any disclosure or discussion of a "set of branch metrics" that can be employed in a detector covered by the Group I Claims. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

143. The "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents is a "single" branch metric function and not a "set" of functions. Dkt. No. 306 at 16-17; Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

144. The "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents is a "single" branch metric and not a "set" of metrics. Dkt. No. 306 at 16-17; Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

145. The "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents includes variables that change from branch to branch. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

146. The Detailed Description of the Invention portion of the CMU patents do not disclose any Viterbi detector where more than one branch metric function is used in the detector. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

147. The Detailed Description of the Invention portion of the CMU patents do not disclose any Viterbi detector where more than one branch metric is used in the detector. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

148. The Detailed Description of the Invention portion of the CMU patents do not disclose a detector that selects a branch metric function from a set of different branch metric functions. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

149. The Detailed Description of the Invention portion of the CMU patents do not disclose a detector that selects a branch metric from a set of different branch metrics. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

150. The Detailed Description of the Invention portion of the CMU patents do not disclose any criteria for making a selection of branch metric functions during operation of a Viterbi detector. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

151. The Detailed Description of the Invention portion of the CMU patents do not disclose any criteria for making a selection of branch metrics during operation of a Viterbi

detector. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

152. The only Viterbi detectors disclosed in the Detailed Description of the Invention portion of the CMU patents are designs that use a "single" branch metric function across different branches of a trellis. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

153. The only Viterbi detectors disclosed in the Detailed Description of the Invention portion of the CMU patents are designs that use a "single" branch metric across different branches of a trellis. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

154. There is no disclosure in the Detailed Description of the Invention portion of the CMU patents of using different branch metric functions in a single detector. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

155. There is no disclosure in the Detailed Description of the Invention portion of the CMU patents of using different branch metrics in a single detector. Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

156. The specifications of the CMU patents describe the "variance dependent" branch metric (Eqn. 10) as a "metric" in the singular, not the plural. Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

157. The specifications of the CMU patents describe the "correlation-sensitive" branch metric (Eqn. 13) as a "metric" in the singular, not the plural. Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

158. Based on the Court's construction of "function," the "correlation-sensitive" branch metric (Eqn. 13) of the CMU patents is a "single" branch metric function. Dkt. No. 306 at 16-17; Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

159. Based on the Court's construction of "function," the "variance dependent" branch metric function (Eqn. 10) of the CMU patents is a "single" branch metric function. Dkt. No. 306 at 16-17; Ex. 1 at col. 6, ln. 14-35; Ex. 2 at col. 6, ln. 32-65.

160. In connection with Figures 7-13 of the CMU patents, whenever the named inventors employed the "correlation-sensitive" branch metric (Eqn. 13), they still referred to the metric as "metric" in the singular (i.e., the "C2 metric") and not "metrics" in the plural (i.e., "C2 metrics"). Ex. 1 at col. 6, ln. 36 to col. 13, ln. 58; Ex. 2 at col. 7, ln. 1 to col. 15, ln. 37.

161. There is no disclosure in the Detailed Description of the Invention portion of the specifications of the CMU patents regarding how one would "select" a particular branch metric function from a set of more than one during operation of a Viterbi detector. Ex. 1, Ex. 2.

162. There is no disclosure in the Detailed Description of the Invention portion of the specifications of CMU patents of what criteria to use in a Viterbi detector to make any selection of a particular branch metric function from a set of more than one during operation of detector. Ex. 1, Ex. 2.

163. The Detailed Description of the Invention portion of the specifications of CMU patents do not disclose any Viterbi detectors that use more than one branch metric function. Ex. 1, Ex. 2.

164. The Detailed Description of the Invention portion of the specifications of CMU patents do not disclose any Viterbi detectors that use more than one branch metric. Ex. 1, Ex. 2.

165. There is no disclosure in the Detailed Description of the Invention portion of the specifications of CMU patents of any step or circuit for selecting a particular branch metric function from a set of different branch metric functions. Ex. 1, Ex. 2.

166. The design illustrated in Fig. 3A of the '839 patent specification is described as a "branch metric computation circuit 48 that computes the metric M_i for a branch of a trellis, as in Equation 13." Ex. 1, '839 patent at col. 7:10-12.

167. The design illustrated in Fig. 3B of the '839 patent specification is described as an "implementation of a portion of the branch metric computation module of Fig. 3A." Ex. 1, '839 patent at col. 2:46-48.

168. Both Fig. 3A and 3B of the CMU patents are directed to an implementation of "correlation-sensitive" branch metric function (M_i). Ex. 1 Figs. 3A and 3B; Ex. 2 Figs. 3A and 3B; Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

169. The branch metric M_i in the CMU patents (Equation 13) includes variables such as target values and noise statistics that vary from branch to branch; Ex. 1 at col. 6, ln. 36 to col. 8, ln. 41; Ex. 2 at col. 7, ln. 1 to col. 9, ln. 8.

170. Figures 3A and 3B of the CMU patents do not disclose or describe any teaching of a "selecting" step. Ex. 1 Figs. 3A and 3B; Ex. 2 Figs. 3A and 3B.

171. Figure 6 of the CMU patents does not describe or illustrate a "selecting" step for "selecting a branch metric function for each of the braches [of a trellis] at a certain time index." . Ex. 1; Ex. 2.

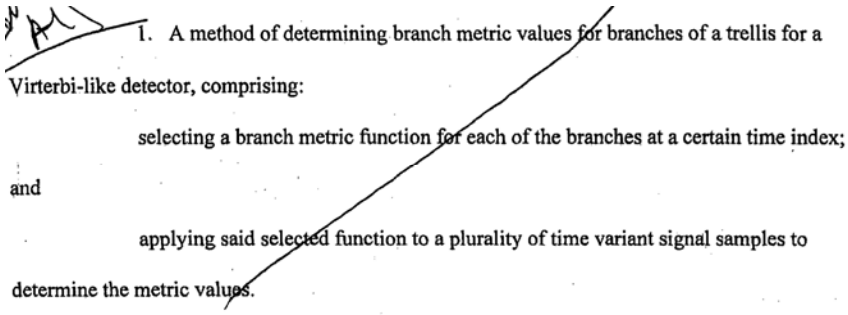
172. Figure 2 of the CMU patents does not describe or illustrate a circuit for "selecting a branch metric function for each of the braches [of a trellis] at a certain time index." Ex. 1; Ex. 2.

173. There is no disclosure in the CMU patent specifications of a detector where the "variance dependent" branch metric function (Equation 10) is combined with the "correlation-sensitive" branch metric function (Equation 13) to form a "set" of branch metric functions from with the "selecting" step of the Group I Claims is to select. . Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

174. A combination of the "variance dependent" branch metric function (Equation 10) and the "correlation-sensitive" branch metric function (Equation 13) of the CMU patents cannot be used to satisfy the subsequent "applying" step of the Group I Claims. . Ex. 1 at Figs. 1-13 & col. 1, ln. 1 to col. 13, ln. 59 & Ex. 2 at Figs. 1-15 & col. 1, ln. 1 to col. 15, ln. 37.

The Prosecution History of the '839 Patent

175. When CMU filed its formal utility patent application introducing the Group I Claims for the first time in April 1998, they were directed to using a **single** branch metric function for calculating a **plurality** of branch metrics at a given time instance in the trellis:



1. A method of determining branch metric values for branches of a trellis for a Virterbi-like detector, comprising:

selecting a branch metric function for each of the branches at a certain time index; and

applying said selected function to a plurality of time variant signal samples to determine the metric values.

Ex. 5, at 25.

176. In claim 1 of the '839 patent as originally filed on April 3, 1998, the "function" that is selected in the 1st ("selecting") step is applied to a plurality of (time variant) signal samples in the 2nd ("applying") step "to determine the metric values" (in the plural). *Id.*

177. Claim 1 of the '839 patent as originally filed on April 3, 1998 required that the same branch metric function be selected for each of the branches in the trellis at a certain time index. *Id.*

178. Claim 1 of the '839 patent as originally filed on April 3, 1998 required that the same branch metric be selected for each of the branches in the trellis at a certain time index. *Id.*

179. Claim 1 of the '839 patent as originally filed on April 3, 1998 required that the same branch metric function be used to determine the various metric values for those branches. *Id.*

180. Claim 1 of the '839 patent as originally filed on April 3, 1998 required that the same branch metric be used to determine the various metric values for those branches. *Id.*

181. Original Claim 1 of the application that led to the '839 patent was initially supported by the specification where Eqn. 13 was referred to as a single "branch metric" even though the metric equation included a number of different variables (including prior noise terms ($\underline{n}_i$) and noise statistics (C_i)). Ex. 5.

182. In the 1st Office Action dated June 12, 2000, claim 1 was rejected over the Fitzpatrick patent. Ex. 6.

183. In response to the rejection over the Fitzpatrick patent in the June 12, 2000 Office Action, CMU amended claim 1 to change "function" in the singular to "functions" in the plural; and "values" in the plural to "value" in the singular:

1. (Amended) A method of determining branch metric values for branches of a trellis for a Virterbi-like detector, comprising:

selecting a branch metric function for each of the branches at a certain time index; and

applying each of said selected [function] functions to a plurality of [time variant] signal samples to determine the metric [values] value corresponding to the branch for which the applied branch metric function was selected, wherein each sample corresponds to a different sampling time instant.

Ex. 7 (Amendment, dated June 12, 2000) at 2.

184. The June 12, 2000 Claim 1 amendment during prosecution of the '839 patent required that different functions be used on different branches of the trellis at a given time index to calculate the metric value for each branch. *Id.*

185. The June 12, 2000 Claim 1 amendment during prosecution of the '839 patent required that different metrics be used on different branches of the trellis at a given time index to calculate the metric value for each branch. *Id.*

186. At the time the June 12, 2000 Claim 1 amendment was made during prosecution of the '839 patent, CMU did not amend the specification to refer to Equation 13 as a ""set"" of branch metric equations (or functions). Ex. 7; Ex. 1.

187. CMU's amendment of the scope of claim 1 of the '839 patent during prosecution is not supported by the specification. Ex. 7; Ex. 1.

188. CMU's amendment of the scope of claim 1 of the '839 patent during prosecution added new matter to the scope of the claims not previously supported at the time the amendment was made. Ex. 7; Ex. 1.

189. There is no mention of the phrase "branch metric functions" in the specifications of the CMU patents other than in the claims. Ex. 1, Ex. 2.

190. There is no mention of the phrase "a set of branch metric functions" in the specifications of the CMU patents. Ex. 1, Ex. 2.

191. The words “selecting” or “select” (or their synonyms “choosing” or “choose”) do not appear anywhere in the Detailed Description of the Invention portion of the CMU patent specifications. Ex. 1; Ex. 2.

192. Based on the Court's interpretation of the “selecting” step, including the word “function,” a person of skill in the art would not be able to clearly distinguish in the Group I Claims what material is claimed from what material is not claimed. Dkt. 306 at 14-18; Ex. 1, Ex. 2.

193. Because of the lack of disclosure of the “selecting” step, including the use of a set of branch metric functions in a detector, a person of skill in the art would not be able to discern the boundaries of the Group I Claims based on the claim language, the specifications, the prosecution history, and the knowledge in the relevant field. Dkt. 306 at 14-18; Ex. 1, Ex. 2.

194. The Group I Claims require a “set” of branch metric functions to be used in a Viterbi detector, but there is no such set disclosed anywhere in the specifications of the CMU patents other than in the claims. Dkt. 306 at 14-18; Ex. 1, Ex. 2.

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Respectfully submitted,

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